

CLAIMS

What is claimed is:

1. A combiner comprising:
 - 5 a) a first printed circuit board having a top surface and a bottom surface;
 - b) a first metallized area substantially covering the bottom surface of the first printed circuit board;
 - c) a first circuit line located on the top surface, the first circuit line having a first end and a second end;
 - 10 d) a second circuit line located on the top surface, the second circuit line having a first end and a second end;
 - e) the first ends of the first and second circuit lines connected to an output port;
 - f) a first input port connected to the first circuit line second end;
 - g) a second input port connected to the second circuit line second end;
 - 15 h) a second printed circuit board having a top surface and a bottom surface, the second printed circuit board mounted over the first printed circuit board;
 - i) a second metallized area substantially covering the top surface of the second printed board; and
 - j) a plurality of non-metallized voids located in the second metallized area above the
 - 20 first and second circuit lines, the non-metallized voids adapted to change the

amplitude unbalance of the combiner.

2. The combiner according to claim 1 wherein, the combiner is mounted within a case.

5 3. The combiner according to claim 2 wherein, the first and second metallized areas are connected to the case.

4. The combiner according to claim 1 wherein, the bottom surface of the second printed circuit board is insulative.

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5. The combiner according to claim 2 wherein, a plurality of fasteners hold the first and second printed circuit boards to the case.

6. The combiner according to claim 1 wherein, the first ends of the first and second
15 circuit lines are connected to a common line that is connected to the output port.

7. The combiner according to claim 1 wherein, an unmetallized area covers a portion of the top surface of the first printed circuit board.

8. A tunable combiner comprising:

a) a case having a cavity, a top surface, a bottom surface, the cavity defining four walls and a mounting surface;

b) a lower printed circuit board having a top surface and a bottom surface, the lower

5 printed circuit board mounted in the cavity on the mounting surface;

c) a first metallized area substantially covering the bottom surface of the first printed circuit board, the first metallized area in electrical contact with the case;

d) a first circuit line located on the top surface and having one end connected to a first input port and another end connected to an output port;

10 e) a second circuit line located on the top surface and having one end connected to a second input port and another end connected to the output port;

f) an upper printed circuit board having a top surface and a bottom surface, the second printed circuit board mounted over the first printed circuit board in the cavity;

g) a second metallized area substantially covering the top surface of the upper printed

15 circuit board; and

h) a first set of non-metallized cavities located in the second metallized area juxtaposed to the first circuit line;

i) a second set of non-metallized cavities located in the second metallized area juxtaposed to the second circuit line, the cavities adapted to change an electrical

20 characteristic of the combiner; and

j) a cover mounted over the cavity and attached to the case.

9. The tunable combiner according to claim 8 wherein, the first and second set of non-metallized cavities are formed by a laser.

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10. The tunable combiner according to claim 8 wherein, the first and second set of non-metallized cavities are formed by mechanical removal of the second metallized area.

11. The tunable combiner according to claim 8 wherein, a plurality of vias extend
10 through the upper and lower printed circuit boards, the vias electrically connecting the first and second metallized areas.

12. The tunable combiner according to claim 8 wherein, the upper and lower printed circuit boards are attached to the case by a plurality of fasteners.

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13. The tunable combiner according to claim 8 wherein, the ends of the first and second circuit lines are connected to a common line that is connected to the output port.

14. The tunable combiner according to claim 8 wherein, an unmetallized area covers a
20 portion of the top surface of the lower printed circuit board.

15. The tunable combiner according to claim 8 wherein, a third metallized area covers a portion of the top surface of the lower printed circuit board.

5 16. The tunable combiner according to claim 8 wherein, at least one connector is mounted to the case, the connector electrically connected to one of the circuit lines.

17. The tunable combiner according to claim 8 wherein, the bottom surface of the upper printed circuit board is insulative.

18. A method of manufacturing a tunable combiner comprising the steps of:

- a) providing a lower printed circuit board having a top surface and a bottom surface, a first metallized area substantially covering the bottom surface of the first printed circuit board and a first circuit line located on the top surface, the first circuit line having one end connected to a first input port and another end connected to an output port, a second circuit line located on the top surface, the second circuit line having one end connected to a second input port and another end connected to the output port;
- b) providing an upper printed circuit board having a top surface and a bottom surface, the second printed circuit board having a second metallized area substantially covering the top surface of the upper printed circuit board;
- c) mounting the upper printed circuit board over the lower printed circuit board;
- d) monitoring the amplitude unbalance of the combiner; and
- e) removing a portion of the second metallized area above the first circuit line to form a first set of cavities.

19. The method according to claim 18 further comprising:

a) monitoring the amplitude unbalance of the combiner; and

b) removing a portion of the second metallized area above the first and second circuit

5 lines to form a second set of cavities until the amplitude unbalance is minimized.

20. The method according to claim 19 further comprising:

a) providing a case having a cavity and a mounting surface;

b) attaching the circuit boards to the mounting surface;

10 c) attaching the ports to a first, second and third connector mounted to the case; and

d) mounting a cover over the cavity to seal the case.